including rays passing through said target object of said specific material of interest as well as rays passing near but not through said target object to remove the contribution of overlying and underlying material from the calculated value characteristic of said target object of said specific material of interest, and

automatically indicating the presence of said target object while said article of luggage or package progresses on said conveyor.

Add claims 153 and 154 that correspond respectively to claims 83 and 85 as follows:

153. The method of claim 152 wherein X-ray data from rays that pass through different regions of said target object of said specific material of interest are employed in said calculations in a manner that effectively averages many pixels over contiguous areas to reduce noise in calculating said values.

154. The method of claim 152 wherein said article of luggage or package is exposed to X-ray radiation at more than one energy to produce said X-ray data and the resulting data at more than one energy is used in calculating said value characteristic of said target object of said specific material of interest.

REMARKS

Claims 82, 83 and 115 have been amended to clarify the contribution of the inventors. Dependent claim 87, for luggage inspection, has been rewritten in independent form as claim 152 and dependent claim 153 and 154 have been added (corresponding to claims 83 and 85).

The inventors have realized that for identifying a target object that may be anywhere in a continuously moving ensemble, systematically over the exposed area performing calculations, which may occur in substantially real time, utilizing rays of a stationary exposure system passing through the target object as well as rays passing near, but not through the target, to remove the contribution of material overlying and underlying the target object, leads to a highly effective and practical inspection system for continuously moving ensembles of objects.

Simple as this may seem, this invention has eluded the many experts that seek to identify plastic explosives covered by other objects in airport baggage. Claim 87 is directed specifically to solving the airport problem that faces the world, now rewritten as independent claim 152.

Claims 85 and 86, now dependent upon claim 152, bring out important further features that enhance the practicality of such inspection.

Claims 83 and 153, dependent respectively on claims 82 and 152, bring out the further advantageous feature of using, in each calculation, rays that pass through different regions of the target area, to, as claimed, effectively average many pixels over contiguous areas to reduce noise in calculating the values. This novel combination of features can enhance the practicality of the system for inspecting moving objects, especially luggage.

Prior to this amendment, the Examiner rejected claims 82, 83, 87 and 115, and others over Doenges in view of Macovski, Giger and Doi, or alternatively, in view of Macovski and Alvarez.

As we will show, neither of these combinations, to the extent proper, fairly teaches the invention of claims 82 and 152, as amended, or the dependent claims.

Doenges is the only cited reference that addresses the inspection of articles on a moving conveyor.

Doenges is content in being able to distinguish organic material from e.g., metals, col. 1, ll. 65-69. Doenges can't be said to even recognize, in the continuously moving conveyor context, the possibility of detecting e.g., plastic explosives when they are masked by unknown objects that underlie or overlie the explosives. Doenges has no suggestion of utilizing rays passing through the target object and rays passing near as having utility in the continuously moving conveyor context, and offers no motivation for doing so.

The Macovski reference stands for showing that dual energy imaging has been known for over 20 years, which Applicants readily admit.

Macovski does not in any way suggest that progressively exposing continuously moving ensembles to rays from a stationary system and calculating values based on these rays passing through the target object as well as rays passing near but not through the target object, is a practical way of improving inspection of conveyor-carried articles.

One will search the remaining references in vain for any fair teaching that would suggest the modification of Doenges to realize the result he did not even suggest.

The main thrust of Giger et al. 5,133,020 is to detect and classify lesions in medical images.

Most of the Giger disclosure concerns use of, previously known information, such as left and right architectural symmetry of the anatomy or comparing two images of the same thing taken at different times, to determine, by comparison, if there has been abnormal growth over the elapsed time (see col. 2, l. 59; col. 3, l. 14).

The Examiner directs our attention to cols. 10 and 11. Here Giger et al. were concerned with classifying lesions already detected, see Fig. 9, a different stage of the process than detecting a target object in the first place. Furthermore, Giger et al. contemplates use, e.g., of a trackball (col. 10, l. 11) by a radiologist to determine the border of a lesion; only then does the passage col. 10, l. 50, come into play. This medical imaging reference can hardly be said to fairly suggest the structure or operation of the present invention.

Doi, 4,851,984, directed to lung examination by removing background according to a sinusoidal function related to the periodicity of the human ribs, likewise does not make up for what the other references lack. All people have similar periodic rib structure, information which Doi exploits. Baggage has no known periodic structure of this kind and the present invention makes no such use.

Nor does the 1977 Alvarez patent, 4,029,963, make up for what the other references lack. Most of Alvarez is related to computerized tomography. Computerized tomography, as understood,

requires the patient or object to be immobile while many X-ray images from many angles are taken to form pictures of slices of the patient or object.

It would certainly involve invention to realize that a CT technique, commonly requiring that the object be stationary for a long time, can be so modified as to have application to airport inspection of articles moving continuously on a conveyor, and the like.

We submit that the Examiner may not have fully understood the significance in the earlier claim of the limitations that the X-ray exposure system is stationary while the ensemble being inspected moves continuously through the beam. The present claim amendments clarify this distinction, and now clearly define applicants' important new invention over the prior art.

For the foregoing reasons, and because all other claims are either dependent on claim 82 or contain all its limitations, it is submitted that the claims as they now stand in this application are clearly allowable over the references of record and early favorable action is requested.

Filed herewith is a check in payment of the excess claims fees required by the above amendments.

Please charge any additional fees, or make any credits, to Deposit Account No. 06-1050.

Respectfully submitted,

Date: August 25, 1995

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